

QUEST

ADVENTURES IN THE WORLD OF SCIENCE

AUTOMATION

32

**MODEL:
MAKE AN
EARTH MOVER**

GIANT POSTER

THREE PROJECTS

FACT FILES ON:

- ▶ *The cell – a living factory*
- ▶ *Robot welders*
- ▶ *Automatic Guided Vehicles*
- ▶ *Non-stop production*
- ▶ *The motor industry*
- ▶ *Food processing*
- ▶ *Skill training*
- ▶ *Recycling*

INSIDE THIS PACK

FACT FILES

- Direct drive robots
- Biological factories
- Quality control
- Paper making
- Continuous casting
- Motivation techniques

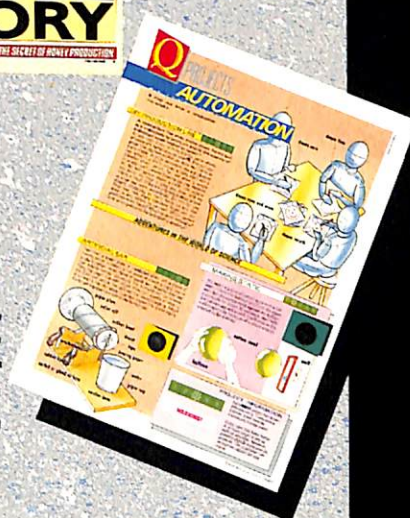


MODEL Multi-purpose earth mover



POSTER
The bee factory

THREE SCIENTIFIC PROJECTS



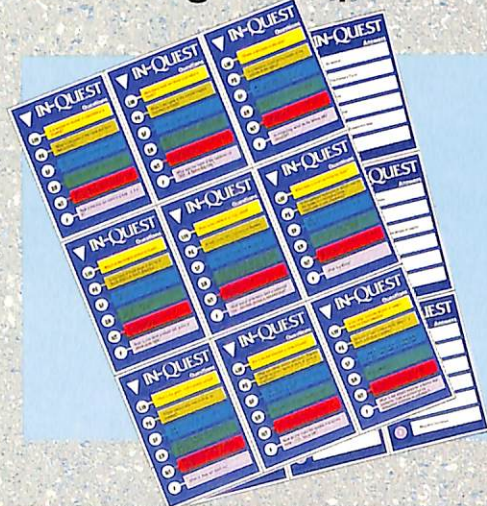
COMING IN QUEST 33 RESCUE

FACT FILES

- Fighting fire
- Lunar 'lifeboat'
- Ejection seats
- Survival clothing
- Rescue services
- Endangered species



POSTER
Project Tiger



PLUS
More In-Quest
Q & A cards





MULTI-PURPOSE EARTH MOVER

MODEL ASSEMBLY INSTRUCTIONS

You will need

Scissors • Ruler • Craft knife • Glue • Cocktail sticks

Before cutting out the pieces, score along all broken lines with a blunt edge and ruler to make folding and gluing easier. Study the ASSEMBLY DIAGRAM to see how the pieces fit together, and use dotted lines as a guide for positioning. Pierce all crosses on sections with a craft knife to make small holes.

NB Younger children will need supervision when using a craft knife.

To make up

Body of earth mover

- 1 Cut out body part **A**. Pierce centre of each cross with craft knife to make very small hole. Fold and glue to shape. Cut out cabin **B**, fold and glue to shape. Glue base of **B** to tabs on upper part of **A** (see ASSEMBLY DIAGRAM).
- 2 Cut out **C** and **D**. Fold and glue to shape. Glue **C** to underside of **B**, following dotted line, to form mudguard on right-hand side. Repeat with **D** to form mudguard on left-hand side of body.
- 3 Cut out **E** and glue to back of **C** (see ASSEMBLY DIAGRAM).
- 4 Cut out stabilizer leg **F** and glue to shape. Cut out leg base **G** and glue coloured side to tabs on base of **F**. Repeat with stabilizer leg **G** and base **I**. Glue **F** and **H** to **E**, following dotted positioning guide (see ASSEMBLY DIAGRAM), taking care that feet are turned inwards.

Telescopic back arm

- 1 Cut out arm base **J**, fold and glue to shape. Cut out **K**, fold and glue to **J**. Glue **J** to **E**.
- 2 Cut out arm section **L**, **M** and **N**. Cut tight hole at centre of each cross on **L**, fold into shape and glue. Repeat with **M**. Fold **N** to

shape, using dotted line as guide (see ASSEMBLY DIAGRAM) and glue. Glue **N** to **M**.

3 Cut out bucket **O** and glue into shape. Glue **O** to end of arm **N**. Cut out hydraulic lever **P** and attach to **O** and **M**, noting positioning dots (see ASSEMBLY DIAGRAM).

4 Cut out lever **Q** and make hole at centre of cross. Fold and glue tab down. Cut out **R** and pierce hole in cross on **R**.

5 Cut out **S**, fold and glue back of one side to **J/K**, (as shown on ASSEMBLY DIAGRAM) making sure that fold is on right-hand side. Glue back of other side of **S** to **L**, following positioning lines.

6 Pierce central hole on one side of **L** with cocktail stick, then skewer stick through hole in **Q**, then through other central hole in **L**. Trim cocktail stick with craft knife.

7 Pierce top hole on side of **L** with cocktail stick, then skewer through both holes in the middle of **M** and other hole in **L**. Trim stick.

8 Slide narrow end of **R** into **Q**. Skewer another stick through one hole at top end of **Q**, hole in **R** and hole at other end of **Q**, then trim stick.

Scraper

1 Cut out scraper **T**, fold to shape and glue. Cut out **U** and glue to slightly turned up edge of **T** (see ASSEMBLY DIAGRAM).

2 Cut out **V**, **W**, **X** and **Y**. Using positioning lines on back of **T** as guide, glue tabs of **V** and **X**, **W** and **Y** (in that order, from left to right) to **T**. **NB** Do not glue **V** to **X** and **W** to **Y**.

3 Cut out arms **Z** and **A1**, making holes in cross marks and cutting slit where indicated. Cut out **B1**, pierce hole in cross and glue tab down. Repeat with **C1**. Cut out **D1** and **E1**.

4 Glue end of **Z** without cross between **V** and **X**. Repeat with **A1**, between **W** and **Y**.

5 Pierce cross at top of **A1** with cocktail stick. Send stick into **A**, through upper cross, out through upper cross on other side of **A** and into hole in **Z**.

6 Slide **D1** through slit in **A1**. Slide **E1** through slit in **Z**. Slip narrow end of **D1** into **B1** and end of **E1** into **C1**. Send stick through cross in **B1**, lower crosses on both sides of **A** and then pierce cross in **C1** with same stick.

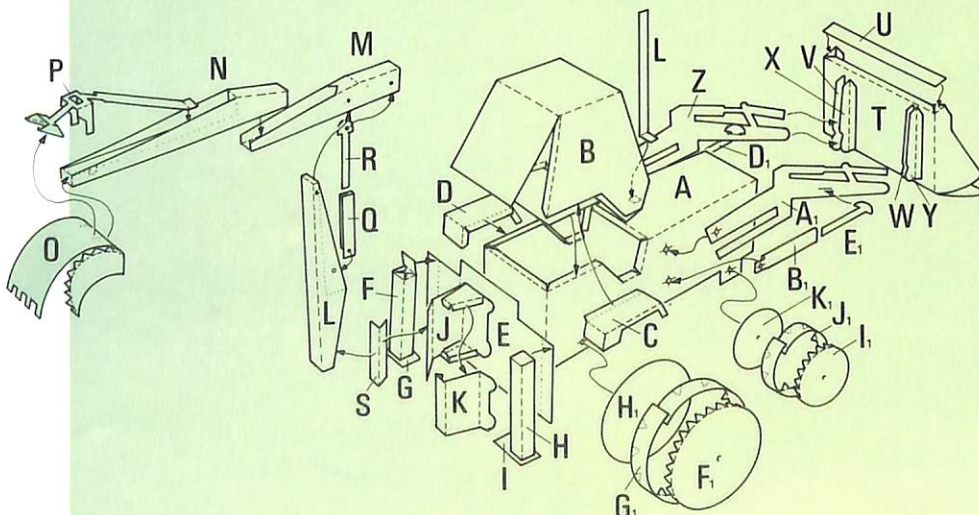
Wheels

1 Cut out back wheel parts **F1**, **G1** and **H1**. Cut hole in centre of **F1** and **H1**. Fold tabs down on **F1** and glue tabs to edge without tabs on **G1**. Fold down tabs on **G1** and stick to **H1**. Repeat to make up other back wheel.

2 Cut out front wheel part **I1**, **J1** and **K1**. Fold down tabs on **I1**, wrap **J1** around tabs and glue, then stick **K1** to tabs on open side. Repeat to make up second front wheel.

3 Push cocktail stick through holes on both sides of one back wheel to make wheel axle and then push stick through cross on side of **A** (see ASSEMBLY DIAGRAM). Trim stick. Repeat with other three wheels.

4 Cut out exhaust pipe **L1** and glue tab to dots on top of **A**.





PROJECTS

AUTOMATION

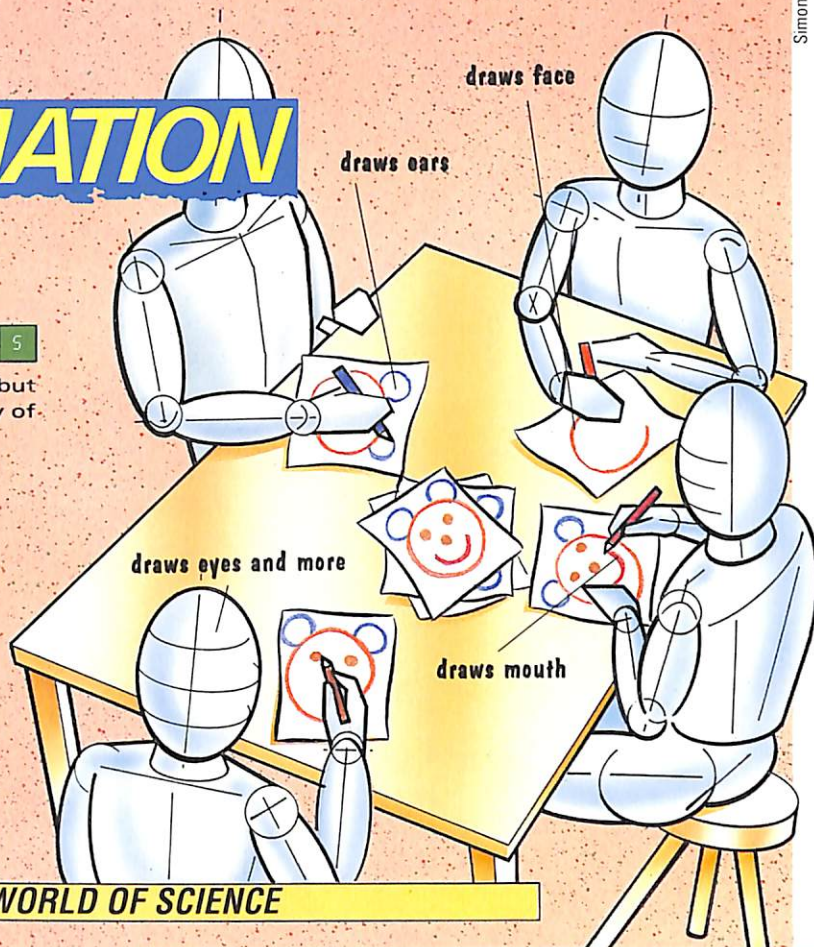
- Find out how a production line works.

DIY PRODUCTION LINE



A production line may make more items but is it enjoyable to work on and is the quality of individual work higher or lower?

All you need is two or three friends, some sheets of paper and some coloured pencils. First cut your paper into quarters so that you have four times as many sheets. Arrange yourselves into a production line, either in a line or around a table, each with a different colour pencil. You will draw a simple face with each person drawing just one element. So, the first person draws a circle; the second, two ears; the third, a nose and eyes; and the fourth, a mouth. If there's only two or three of you, arrange the work accordingly. Do this for one minute, producing as many faces as you can. Then see how many complete faces you can draw in one minute, by yourself. Which system produces more faces? Which is more enjoyable? And which produces the best quality drawings?



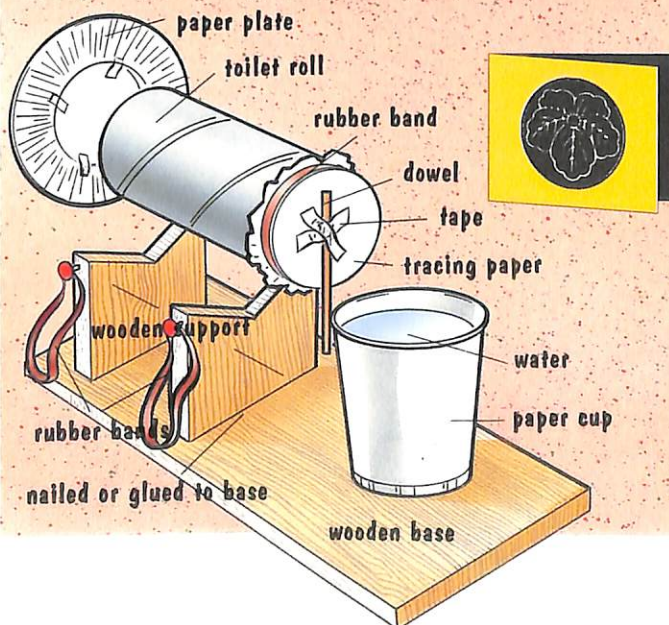
Simon Critchley

ADVENTURES IN THE WORLD OF SCIENCE

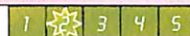
ARTIFICIAL EAR



You need a paper plate, a cardboard toilet-roll, a piece of tracing paper, a button, a thin piece of dowel, a paper cup or yoghurt carton, small sheet of wood, four drawing pins and four rubber bands. Construct the artificial ear as shown, filling the paper cup with water. Then turn a radio on near to the plate and watch. You will see the dowel vibrating. Adjust it so that it hits the paper cup and makes the water ripple. Each part represents a part of the human ear.



MAKING STATIC



You need a piece of cotton wool and a balloon. Inflate the balloon and knot the open end. Rub the cotton wool against the balloon vigorously for about 30 seconds, then hold the balloon against a wall. It will stick to the wall temporarily because of a static charge created by the rubbing.



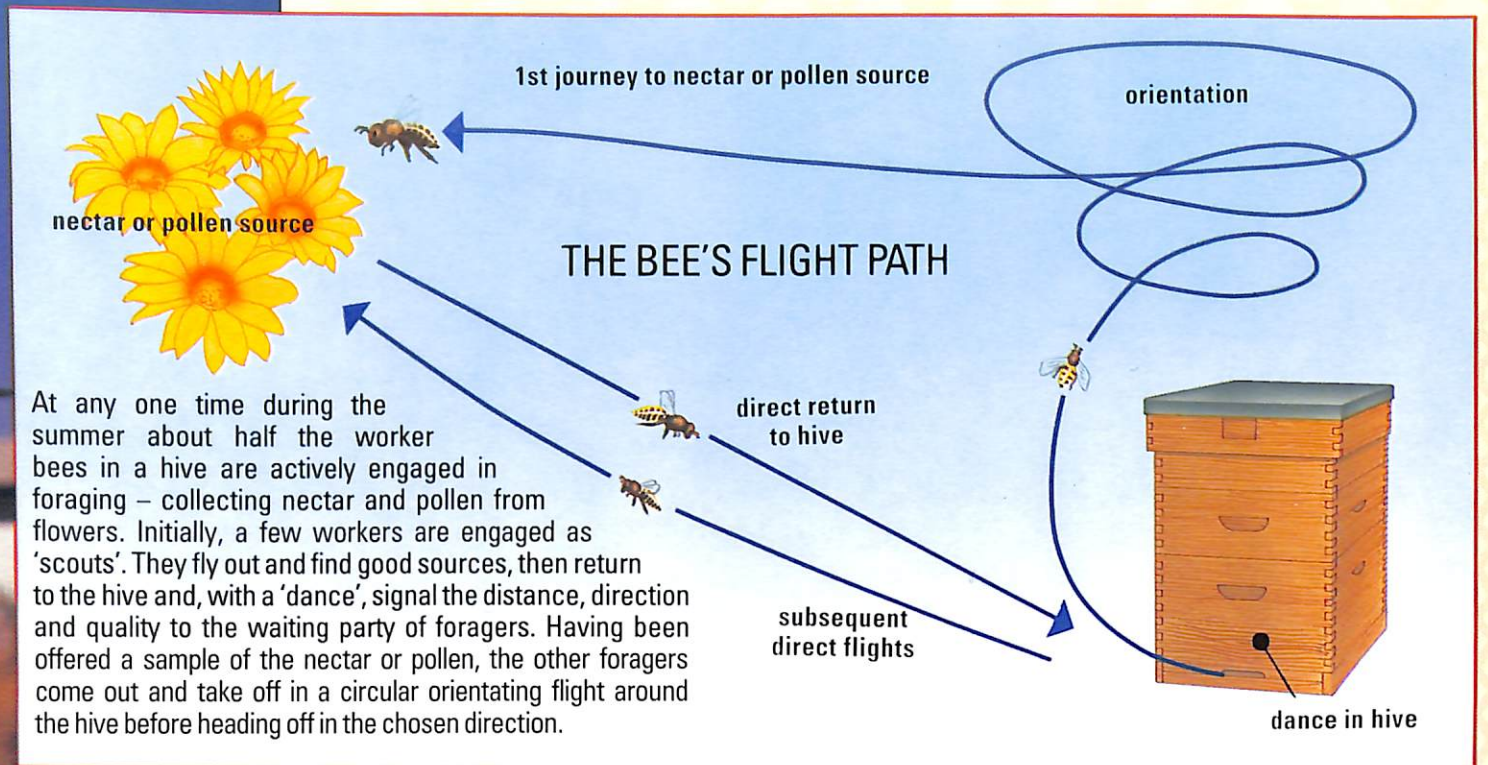
PROJECT INFORMATION



Each **QUEST** project has its own difficulty rating: 1 very simple, 2 simple, 3 intermediate, 4 advanced, 5 complicated.

WARNING!

Every care has been taken to ensure projects are as safe as possible. However, parents should supervise all projects. The publisher can accept no liability for any injury.



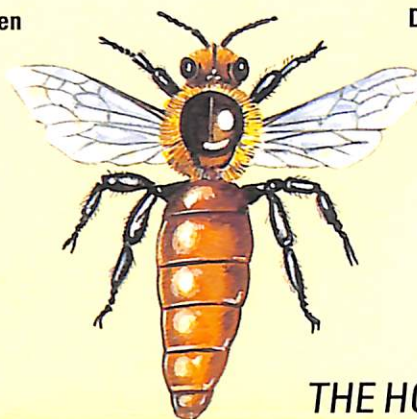
Mark Franklin

A beekeeper, properly covered to prevent stings, lifts a fully colonized comb from the hive for inspection. The combs are ready for harvesting by midsummer of the second year.

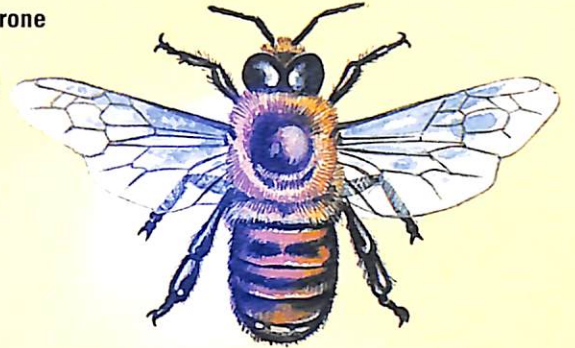
QUEST

Jeff Foot/Bruce Coleman Ltd

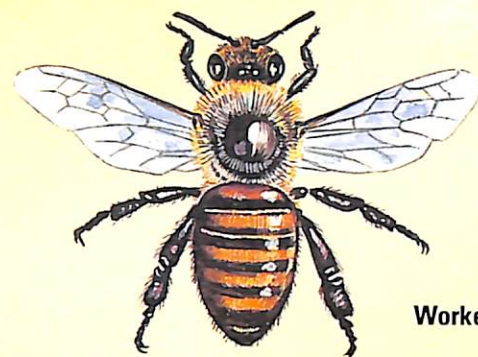
Queen



Drone



THE HONEYBEES



Worker

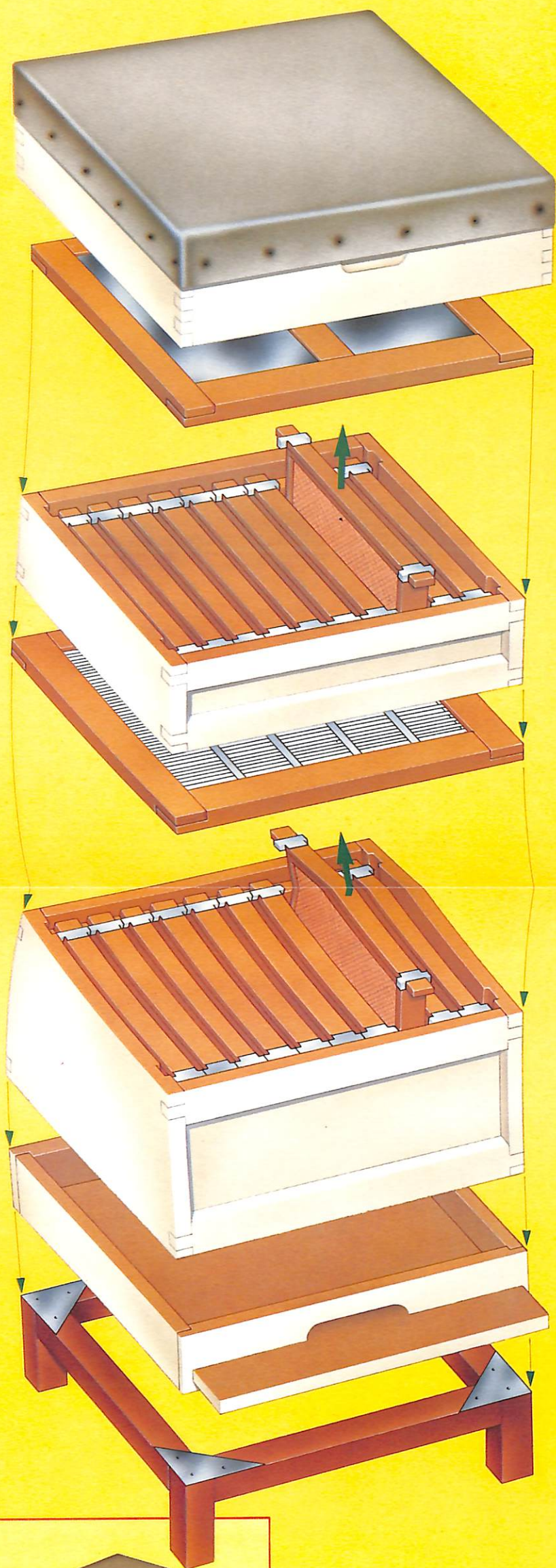
Julian Holland Publishing Ltd

A colony of honey bees contains three distinct types. The solitary queen is longer than the rest with smaller wings and head. She lives for three years and having mated, lays about half a million eggs – her sole task. Each summer some 200-1,000 drones emerge. Larger and squatter than the workers, their only function is to mate with the queen

then, after three or four months, they are killed by the workers. The worker is the smallest. In the summer there may be over 50,000 in a colony – doing everything from building the comb to foraging for nectar and pollen. Their life expectancy is proportional to the amount of work – just six weeks in summer and up to six months at other times.

THE BEE FACTORY

THE SECRET OF HONEY PRODUCTION



Mark Franklin

THE BEEHIVE

The hive is the best way to keep a colony of 50-60,000 honey bees in a controlled environment where they can produce the maximum amount of honey for human use. Bees would be just as happy living in an old log or under the eaves of a house, but it would be almost impossible to harvest their honey or look after them through the winter. All modern hives consist of a collection of boxes including the brood box (the home for the bees) and the 'supers' which store honey.



MULTI-PURPOSE EARTH MOVER

